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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/704,498	11/06/2003	Justin K. Brask	42P17821	3238

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EXAMINER

CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 08/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/704,498

Applicant(s)

BRASK ET AL.

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1106.122303.112604.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verhaverbeke (US 5,972,123) or David et al. (US 6,015,505).

In a method for wet etching a metal layer, Verhaverbeke (col. 3, lines 25-28; col. 4, lines 21-24, 51-54; col. 5, lines 30-32) or David et al. (abstract; col. 6) teaches that a metal layer (including a metal recited in instant claim 3) may be formed on a substrate. The metal layer has a thickness. The metal layer may be exposed to a wet etch chemistry such as a chelating agent (e.g., EDTA). Verhaverbeke or David is not particular about the thickness of metal being etched. Hence, it would have been obvious to one with ordinary skill in the art to use the desired thickness depending on the particular product requirement, and it is common in the art of semiconductor device fabrication that thin metal layer may be less than about 100 angstroms. Since chelating agent (e.g., EDTA) is used as an active ingredient in the wet etchant, it is expected that the diameter of the active ingredient exceed the thickness of the metal layer.

Dependent claim 5 differs from the prior art by specifying various concentrations of the ingredient of etchant (e.g., moles/liter of a chelating agent). However, same is known to be result effective variable and commonly determined by routine experiment. The process of conducting routine experimentations (optimizations) so as to produce an expected result is obvious to one of ordinary skill in the art.). In the absence of showing criticality or unexpected results, a person having ordinary skill in the art would have found it obvious to modify prior art by performing routine experiments (by using various concentrations) to obtain optimal result with a reasonable expectation of success.

3. Claims 6-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verhaverbeke (US 5,972,123) in view of Adetutu et al. (US 6,902,969) or Gilmer et al. (US 2004/0191974).

In a method for wet etching a metal layer, Verhaverbeke (col. 3, lines 25-28; col. 4, lines 21-24, 51-54; col. 5, lines 30-32) teaches that a metal layer (including metals of claim 3) may be formed on a substrate. The metal layer has a thickness. The metal layer may be exposed to a wet etch chemistry such as a chelating agent (e.g., EDTA). Verhaverbeke is not limited to any particular structure of semiconductor device being etched, but teaches using wet etching method for integrate circuits (col. 4, lines 51-54). Hence, it would have been obvious to one with ordinary skilled in the art to etch the structures commonly used in the semiconductor device fabrication. In a method for making a semiconductor device, Adetutu (col. 2; col. 3, lines 33-35; col. 5, lines 61-65;

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Figures) or Gilmer ([0005] [0008] [0023] [0025] [0028]; Figures) teaches a high-k gate dielectric layer may be formed on a substrate. A metal layer may be formed thereon. The first metal layer may be less than about 100 angstroms thick (or 50 angstroms). The first portion of the first metal layer may be removed. A second metal layer may be formed on the high-k gate dielectric, the first portion of the second metal layer covering the remaining portion of the first metal layer and a second portion of the second metal layer covering the high-k gate dielectric layer. The second metal layer may be less than about 100 angstroms thick (or 50 angstroms). A masking layer may be formed, the metal may be wet etched. Hence, it would have been obvious to one with ordinary skill in the art to use the wet etch method and etchant to etch the structure of Adetutu or Gilmer because it is a well-known structure in the art of semiconductor device fabrication and because it is disclosed by Adetutu or Gilmer. Since removing metal (etching) is not completed instantaneously, the etching process comprises the limitation of "without removing more than about 100 angstroms (or 50 angstroms)" during the process. As to the materials for the metal layer (or the first metal and the second metal), Adetutu ( col. 5, lines 61-65) teaches various materials may be used for p-channel gate or n-channel gate, hence, it would have been obvious to one with ordinary skill in the art to use any common p-type metals and n-type metals, and Gilmer ([0008]) discloses various common p-type metals and n-type metals for CMOS.

The claimed invention differs from the prior art by specifying well-known features (such as using polysilicon as mask in claims 9, 11, 16) to the art of semiconductor device fabrication (the examiner takes official notice) and using various

concentrations of the ingredient of etchant (e.g., moles/liter of a chelating agent).

However, same is known to be result effective variable and commonly determined by routine experiment. The process of conducting routine experimentations (optimizations) so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or unexpected results, a person having ordinary skill in the art would have found it obvious to modify prior art by performing routine experiments (by using various concentrations) to obtain optimal result and adding same well-known feature to same in order to provide effective masking with a reasonable expectation of success.

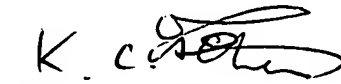
The above-cited claims (claims 13, 14, and 17) differ from the prior art by specifying work functions (e.g., 3.9 eV- 4.2eV; 4.9eV –5.2eV) of the metal layer. However, since n-type metal and p-type metal may be used in the prior art, same work functions (e.g., 3.9 eV- 4.2eV; 4.9eV –5.2eV) of the metal layer would be expected.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status

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information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

July 29, 2005

A handwritten signature in black ink, appearing to read 'K. C. Chen', with a stylized flourish at the end.

Kin-Chan Chen  
Primary Examiner  
Art Unit 1765